



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO.       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------------|-------------|----------------------|---------------------|------------------|
| 10/678,994            | 10/03/2003  | Hiroyuki Shimada     | 59521 (48229)       | 8918             |
| 21874                 | 7590        | 06/20/2005           | EXAMINER            |                  |
| EDWARDS & ANGELL, LLP |             |                      | CHEN, KIN CHAN      |                  |
| P.O. BOX 55874        |             |                      | ART UNIT            |                  |
| BOSTON, MA 02205      |             |                      | PAPER NUMBER        |                  |

1765

DATE MAILED: 06/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/678,994

Applicant(s)

SHIMADA, HIROYUKI

Examiner

Kin-Chan Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 100303:112204.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Specification***

1. The disclosure is objected to because of the following informalities:

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1,2, and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Suzawa et al. (US 6,773,996).

In a method for semiconductor device fabrication, Suzawa teaches that an insulating layer may be formed above a semiconductor layer. A conductive layer including at least one of a tantalum layer and a tantalum nitride layer may be formed.

Art Unit: 1765

The conductive layer may be etched by using a gas including  $\text{NF}_3$  and fluorocarbon.

The conductive layer may be etched by using a gas including  $\text{SiCl}_4$  and  $\text{NF}_3$ . See col.

11, line 35 through col. 12.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 3, 7, 8, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzawa et al. (US 6,773,996).

The above-cited claims differ from Suzawa by specifying various composition (e.g., ratio of the flow rate of etchant) and processing parameters (such as claim 3). However, same were known to be result effective variables and commonly determined by routine experiment. The process of conducting routine experimentations (optimizations) so as to produce an expected result is obvious to one of ordinary skill in the art.). A person having ordinary skill in the art would have found it obvious to modify admitted prior art by performing routine experiments (by using various compositions and different processing parameters) to obtain optimal result. Dependant claims 7,8, 10, and 11 differ from Suzawa by specifying various angles / dimensions of the etched product (e.g., angles between the etched conductive layer and the insulating layer). Same are

merely a matter of choices of design depending on the product requirements, since same etchants are being used, it would be obvious to one skilled in the art to modify the process parameters so as to achieve the desired etch selectivity, and therefore various angles /dimensions of the etched product in order to accommodate the specific product design and meet the product requirement.

6. Claims 5, 6, 9, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzawa et al. (US 6,773,996) in view of JP 2001-298193.

In a method for semiconductor device fabrication, Suzawa teaches that an insulating layer may be formed above a semiconductor layer. A conductive layer including at least one of a tantalum layer and a tantalum nitride layer may be formed. The conductive layer may be etched by using a gas including  $\text{NF}_3$  and fluorocarbon. The conductive layer may be etched by using a gas including  $\text{SiCl}_4$  and  $\text{NF}_3$ . See col. 11, line 35 through col. 12.

Unlike the claimed invention, Suzawa does not disclose that a first tantalum nitride layer, body centered cubic lattice phase tantalum layer, and a second tantalum nitride layer may be formed and etched. In a method of semiconductor device fabrication, JP 2001-298193 (abstract; [0037]) teaches that a gate electrode of MOSFET may have the structure of a first tantalum nitride layer, body centered cubic lattice phase tantalum layer, and a second tantalum nitride layer. Suzawa teaches working a gate electrode by dry etching. Suzawa is not particular about the gate electrode being working on. Hence, it would have been obvious to one with ordinary skill

in the art to work the structure of JP 2001-298193 in the process of Suzawa so as to form a gate electrode of MOSFET.

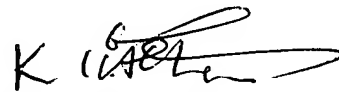
The above-cited claims differ from Suzawa by specifying various composition (e.g., ratio of the flow rate of etchant) and processing parameters (such as claim 6). However, same were known to be result effective variables and commonly determined by routine experiment. The process of conducting routine experimentations (optimizations) so as to produce an expected result is obvious to one of ordinary skill in the art.). A person having ordinary skill in the art would have found it obvious to modify admitted prior art by performing routine experiments (by using various compositions and different processing parameters) to obtain optimal result. Dependant claims 9 and 12 differ from Suzawa by specifying various angles / dimensions of the etched product (e.g., angles between the etched conductive layer and the insulating layer). Same are merely a matter of choices of design depending on the product requirements, since same etchants are being used, it would be obvious to one skilled in the art to modify the process parameters so as to achieve the desired etch selectivity, and therefore various angles /dimensions of the etched product in order to accommodate the specific product design and meet the product requirement.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1765

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*June 16, 2005*

A handwritten signature in black ink, appearing to read 'K. Chen', with a stylized flourish extending to the right.

Kin-Chan Chen  
Primary Examiner  
Art Unit 1765